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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/585,121

06/30/2006

Tsukasa Maruyama

21713-00032-US1

8319

30678

7590

03/22/2012

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EXAMINER

CHAN, HENG M

ART UNIT

PAPER NUMBER

1728

MAIL DATE

DELIVERY MODE

03/22/2012

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/585,121	MARUYAMA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	HENG CHAN	1728	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 5) ☒ Claim(s) 1-20 is/are pending in the application.
- 5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____.                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____.   | 6) <input type="checkbox"/> Other: ____.                          |

## **DETAILED ACTION**

### ***Status of Application***

1. Applicant's remarks filed 12/14/2011 have been acknowledged. Claims 1-20 are pending.

### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The previous rejection of claims 1-5 and 9-16 under 35 U.S.C. 103(a) as being unpatentable over WO 2004/017452 to Yoshikawa et al. (English equivalent US 2005/0260786 used for citation), as evidenced by EP 1622178 to Zakeerunddin et al., in view of JP 10-245453 to Tanaka et al. (machine translation provided for citation) as generally presented in the previous Office action is proper and stands.

The previous rejection of claims 6-8 and 17-20 under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa et al., Zakeerunddin et al., and Tanaka et al. as applied to claims 1 and 5 above, in view of US 2005/0072462 to Kang et al. as generally presented in the previous Office action is proper and stands. The rejections have been reiterated below for convenience.

2. **Claims 1-5 and 9-16 are rejected under 35 U.S.C. 103(a) as being unpatentable by WO 2004/017452 to Yoshikawa et al. (English equivalent US 2005/0260786 used for citation), as evidenced by EP 1622178 to Zakeerunddin et**

**al., in view of JP 10-245453 to Tanaka et al. (machine translation provided for citation).**

Regarding claims 1-3, Yoshikawa et al. teach an electrolyte for a photovoltaic device comprising an ionic liquid, e.g. 1,2 dimethyl-3-propylimidazolium iodide or an oxidation-reduction substance solution containing 1,2 dimethyl-3-propylimidazolium iodide, carried by a vulcanized rubber containing clay (abstract; [0009]; [0034-39]; [0112]; [0200-0207]). This definition of ionic liquid is supported by Zakeerunddin et al., who also relate to an electrolyte for a photovoltaic device and define ionic liquid or “room temperature molten salt” as an electrochemically active salt having a melting point lower than ambient temperature, or a salt selected so that the mixture formed by this salt and another species of the redox system has a melting point lower than ambient temperature, illustrating the general formulae (a) and employing 1,2 dimethyl-3-propylimidazolium iodide in electrolyte example VI (abstract; [0047-52]; [0076-77]).

Yoshikawa et al. do not expressly teach that the clay in the vulcanized rubber contains a layered clay mineral and/or an organically modified layered clay mineral as per claim 1 or that the layered clay mineral and/or an organically modified layered clay mineral is produced as per claims 2 and 3.

Tanaka et al. also relate to vulcanized rubber and teach a clay composite rubber material comprising layered clay minerals modified by gum oligomers and organic onium ions (abstract; Fig. 1; [0006-13]; [0033-35]).

It would have been obvious to one of ordinary skill in the art at time of invention to have used the clay composite rubber material of Tanaka et al. as the vulcanized

rubber in the electrolyte of Yoshikawa et al., because the skilled artisan would have appreciated making the electrolyte of Yoshikawa et al., which is a thin layer requiring excellent safety and durability and low price, using the clay composite rubber material of Tanaka et al. which has high elastic modulus and excellent mechanical property, is suitable for producing thin material and mold goods of complicated shape, and can be manufactured easily (Yoshikawa [0009]; Tanaka [0001]). As per claims 2 and 3, the instant claims are product-by-process claims and product-by-product claims are not limited to the manipulations of the recited steps, only the structure implied by the steps. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP § 2113. Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). See MPEP § 2112.01. In this case, the ionic liquid would have been carried on the clay composite rubber material containing the layered clay mineral organically modified by organic onium ions (Yoshikawa abstract; [0009]; [0034-39]; [0112]; [0200-0207]; Tanaka abstract; Fig. 1; [0006-13]; [0033-35]).

Regarding claims 4, 10, and 12, said ionic liquid is an imidazolium salt, 1,2 dimethyl-3-propylimidazolium iodide (abstract; [0200-0207]).

Regarding claims 5, 11, 13, and 14-16, Yoshikawa et al. teach a photovoltaic device comprising a photoelectrode including a transparent conducting layer and a metal oxide semiconductor film, a counter electrode arranged facing said photoelectrode and an electrolyte layer arranged between said photoelectrode and said counter electrode, wherein electrolyte layer is an electrolyte according to claims 1-4, respectively (Figs. 1 and 3-5; [0007]; [0247]; [0250]; [0280]; [0282]). Yoshikawa et al. teach using porous TiO<sub>2</sub> particles having a primary particle diameter of 30 nm in the metal oxide semiconductor film ([0466-467]); the metal oxide semiconductor film has to be mesoporous.

Regarding claim 9, Yoshikawa et al. teach a dye-sensitized solar cell comprising a photovoltaic device according to claim 5 and a photosensitizing dye carried on the metal oxide semiconductor mesoporous film of the photovoltaic device ([0007]).

**3. Claims 6-8 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa et al., Zakeerunddin et al., and Tanaka et al. as applied to claims 1 and 5 above, in view of US 2005/0072462 to Kang et al.**

Regarding claims 6-8 and 17-20, the claimed conductive substrate is considered to be the counter electrode of claim 5 and its structure is a conductive polyaniline coating on a substrate. Yoshikawa et al. teach a counter electrode **4** (abstract).

Yoshikawa et al. do not expressly teach that the counter electrode is obtained by coating, on a substrate, a conductive polyaniline dispersion as claimed.

Kang et al. also relate to a photovoltaic device and teach a counter electrode coated with polyaniline (abstract; [0024]).

It would have been obvious to one of ordinary skill in the art at time of invention to have used a counter electrode coated with polyaniline like that of Kang et al. in the photovoltaic device of Yoshikawa et al., because the skilled artisan would have used a conventionally used counter electrode in the same device and would have obtained expected results. A photovoltaic device or dye-sensitizing solar cell comprising the counter electrode would have also been obtained. Product-by-product claims 6-8 and 17-20 are not limited to the manipulations of the recited coating and polymerization steps, only the structure implied by the steps. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP § 2113. Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). See MPEP § 2112.01.

#### ***Response to Arguments and Declaration***

4. Applicant's arguments filed 12/14/2011 have been fully considered but they are not persuasive. Applicant cited page 14, lines 5-26 of the specification for the definition that “ionic liquid” exists in the form of liquid under ambient temperature, i.e. a room temperature and, therefore, when used as an electrolyte, the use of a solvent is not necessary. Firstly, the use of solvent is not claimed and so the argument pertaining to

the use of solvent or the lack thereof is irrelevant. Secondly, the section of the specification cited does not specify any temperature range at which the ionic liquid exists and so the definition provided by Applicant is thus not supported by the specification. As presented in the interview, a website "Organic Chemistry Portal" (attached) defines the term as "an ionic liquid is a salt in which the ions are poorly coordinated, which results in these solvents being liquid below 100°C, or even at room temperature (room temperature ionic liquids, RTIL's)." This broader definition of the term does not only include the room temperature ionic liquids as asserted by Applicant, but also those that melt below 100°C.

Yoshikawa teaches 1,2 dimethyl 1-3-propylimidazolium iodide in the electrolyte (abstract; [0112]; [0200-207]). This compound, though seems to be a solid at 20°C as indicated in the MSDS provided by Applicant, is recognized as an ionic liquid by the Zakeerunddin reference (EP 1622178) and an attached "Ionic Liquids" webpage. Applicant cited "High-performance dye-sensitized solar cells based on solvent-free electrolytes produced from eutectic metals" Nature Materials, vol. 7, Aug. 2008: "1-ethyl-3-methylimidazolium iodide (EMII) and 1,3- dimethylimidazolium iodide (DMII) are solids at ambient temperature on probable account of their high lattice Gibbs energies due to the conformational rigidity of small and symmetric cations" (please see page 626, right column, lines 11 - 15). This still does not negate that the fact that 1,2 dimethyl 1-3-propylimidazolium iodide or DMII is an ionic liquid because ionic liquids can exist as a liquid at below 100°C. The EMIH compound cited above is one of such compounds (mp 79°C according to an attached webpage of "TCI America").



Applicant then argued that Yoshikawa merely suggests the use of clay along with a number of other fillers in vulcanized rubber and does not teach the claimed layered clay mineral and/or organically modified layered clay mineral. Applicant submitted a Declaration by Dr. Tsukasa Maruyama and presented evidence that the clay gel electrolyte is superior to comparative electrolytes containing carbon black, talc, and calcium carbonate, respectively. However, the evidence presented does not include an electrolyte having clay or vulcanized rubber having clay as a filler and so the Declaration does not support non-obviousness or improved results of the present invention. Applicant argued that Yoshikawa does not lead one to select clay as the "lead" filler and then modify the clay to achieve the results according to the present invention. The Examiner does not think that clay has to be a lead filler to be modified. The fact that Yoshikawa teaches vulcanized rubber with clay as one of a finite list of fillers would lead one to use such a material for the electrolyte and one would have looked to prior arts like Tanaka to select an appropriate rubber material having a clay filler for the purpose.

In response to applicant's argument that Tanaka is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, the electrolyte of Yoshikawa et al. requires a thin layer requiring excellent safety and durability and low price ([0009]) and Tanaka provides a clay rubber composite

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comprising a layered clay mineral ([0033-35]) having high elastic modulus and excellent mechanical property, is suitable for producing thin material and mold goods of complicated shape, and can be manufactured easily ([0001]). Tanaka also teaches that it has high barrier property to fluids ([0007]). Thus, Tanaka is analogous art and addresses the requirements of the electrolyte of Yoshikawa.

Therefore, a prima facie case of obviousness has been established and the dependent claims remain rejected as well.

### ***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENG CHAN whose telephone number is (571)270-

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5859. The examiner can normally be reached on Monday to Friday, 9:30 am EST to 6:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer K. Michener can be reached on (571)272-1424. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HENG M CHAN/  
Examiner, Art Unit 1728

/Jennifer K. Michener/  
Supervisory Patent Examiner, Art Unit 1728